



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/055,785	01/25/2002	Robert Hammer	2002-01	8749

7590 03/03/2004
Lawrence W. Langley
2733 Big Falls Road
Blacksburg, VA 24060

EXAMINER

PRUCHNIC, STANLEY J

ART UNIT	PAPER NUMBER
----------	--------------

2859

DATE MAILED: 03/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/055,785	Applicant(s) HAMMER ET AL.	
	Examiner Stanley J. Pruchnic, Jr.	Art Unit 2859	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 November 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 21-42 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 21-42 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 May 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Objections

1. Claims 21, 28, 29, 37 and 38 are FINALLY objected to because of the following informalities:

- a. In Claim 21, Line 3: "the axis of said thermopile" lacks antecedent basis.
- b. In Claim 21, Line 4: "said vector" lacks antecedent basis. Perhaps, the word --component-- should be inserted after "vector" in Line 4 in order to more clearly describe the invention.
- c. In Claim 28, Line 1: "the end of said plug" lacks antecedent basis, since it is considered that there are two ends of a cylindrical plug. This can be simply corrected simply by deleting "the" before "end" and replacing therefor the indefinite article --a--.
- d. In each of Claims 29, 37 and 38, in Line 1: "the end of said plug" lacks antecedent basis. Perhaps again, delete "the" before "end" and replace therefor the indefinite article --a-- in order to more clearly describe the invention.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Art Unit: 2859

3. Claims 21 and 22 are FINALLY rejected under 35 U.S.C. 102(b) as being anticipated by *SALLEE et al.* (U.S. Pat. No. 4,817,436, hereinafter **SALLEE**).

SALLEE discloses or suggests a sensor for measuring a vector component of heat flux comprising:

a thin flat substrate plate 2 (Fig. 1; Col. 6, Lines 17-35) of thermally conducting, electrically insulating material;

a thin film thermopile (comprising first pattern 8; Col. 5, Lines 31-50) deposited on a surface 2a of said substrate; with the axis of the thermopile aligned with said vector (as claimed by Applicant in Claim 21 -- the **SALLEE** thermopile axis considered to be oriented in the direction orthogonal to the plane of surface 2a); and

electrical connections E_1 , S_1 (Col. 6, Lines 39-45) on said thin film thermopile for measuring its voltage as claimed by Applicant.

Further regarding Claim 22: **SALLEE** discloses the sensor further comprising a thin, flat cover plate 24 of thermally conducting, electrically insulating material (Col. 6, Lines 17-35) covering the thermopile on said substrate plate.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 23-32 are FINALLY rejected under 35 U.S.C. 103(a) as being unpatentable over **SALLEE** and further in view of U.S. Pat. No. 4,904,091 (**WARD**).

SALLEE discloses or suggests a sensor for measuring a vector component of heat flux as claimed by Applicant in Claims 23, 25, 27, 29 and 30-32, including the limitations of Claims 21 and 22, as described above in Paragraph 3. Further regarding Claims 30 and 32: **SALLEE** discloses or suggests the materials have thermal properties closely matching those of the solid body, the materials being copper, being a metal, and further having a thin coating of electrical insulating material over at least a part of their surfaces as claimed by Applicant in claims 30 and 32.

SALLEE as described above, does not disclose a means for holding together and imbedding said plates within a solid body as claimed by applicant in Claim 23, nor the further limitations including a cylindrical and/or threaded plug including a slot for holding the plates together as claimed by Applicant in Claims 23-29, nor the particular materials as claimed by Applicant in Claim 31, the material of the plate and cover being aluminum nitride.

WARD discloses that is known in the art to embed a sensor in a solid body (Col. 2, Lines 50-66) using a cylindrical plug 11, including a slot formed in the end and side of the plug (Col. 2, Lines 15-54) for holding the detector, as claimed by Applicant in Claims 25, 27 and 29; and further, **WARD** discloses the plug is threaded as claimed by Applicant in Claims 24, 26 and 28.

WARD is evidence that ordinary workers in the field of temperature and heat flux measurement would recognize the benefit of providing means for imbedding the sensor

in the body comprising a cylindrical threaded plug 11, and including a slot formed in the end and side of the plug as taught by WARD for the heat flux sensor of **SALLEE** in order to benefit from avoiding undesirable protrusions beyond the test surface.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the heat flux sensor of **SALLEE** with a means for imbedding comprising a threaded cylindrical plug 11, including a slot formed in the end and side of the plug as taught by WARD in order to benefit from avoiding undesirable protrusions beyond the test surface as taught by WARD.

Further regarding Claims 30 and 32: **SALLEE** discloses or suggests the materials have thermal properties closely matching those of the solid body, the materials being copper, being a metal, and further having a thin coating of electrical insulating material over at least a part of their surfaces as claimed by Applicant in claims 30 and 32.

Regarding the material of the plate and cover being aluminum nitride as claimed by Applicant in Claim 31: **SALLEE** discloses copper plate and cover material.

With respect to the particular materials of the plate and cover (*i.e.*, aluminum nitride): the particular type of materials of the plate and cover, absent any criticality, is only considered to be the use of a "preferred" plate and cover material out of a plurality of well known materials commonly used to enclose a sensor that a person having ordinary skill in the art at the time the invention was made would have found obvious to provide using routine experimentation based, among other things, on the intended use of applicant's apparatus, *i.e.*, suitability for the intended use of applicant's apparatus. See In re Lachine, 125 USPQ 416 (CCPA 1960) where the court stated that a selection of a material on the basis of suitability for the intended use of an apparatus would be entirely obvious.

Thus it would have been obvious to one of ordinary skill in the art to substitute aluminum nitride for the copper plate and cover material of **SALLEE**, when the sensor is modified as taught by WARD, because of its known electrically insulating properties in order to electrically insulate the substrate and also because of its high value of thermal conductivity making it an optimum material for a heat flux gauge.

7. Claims 33-42 are FINALLY rejected under 35 U.S.C. 103(a) as being unpatentable over **SALLEE** in view of **WARD**.

SALLEE discloses or suggests a sensor for measuring heat flux along an axis within a solid body as claimed by Applicant in Claims 33-42.

a thin flat substrate plate 2 (Fig. 1; Col. 6, Lines 17-35) of thermally conducting, electrically insulating material;

a thin film thermopile (comprising first pattern 8; Col. 5, Lines 31-50) deposited on a surface 2a of said substrate; with hot 8 and cold 10 junction pairs aligned with said axis (the **SALLEE** solid body axis considered to be oriented in the direction orthogonal to the plane of surface 2a); and

electrical connections E₁, S₁ (Col. 6, Lines 39-45) on said thin film thermopile for measuring its voltage as claimed by Applicant.

Further regarding Claim 34: **SALLEE** discloses the sensor further comprising a cover plate 24 of thermally conducting, electrically insulating material (Col. 6, Lines 17-35) for covering the thermopile on said substrate plate.

Further regarding Claims 41 and 42: **SALLEE** discloses or suggests the materials have thermal properties closely matching those of the solid body, the materials being copper, which is well known to be a good conductor of heat.

SALLEE as described above, does not disclose a means for imbedding said plates within a solid body as claimed by applicant in Claims 35-36, nor the further limitations including a cylindrical and/or threaded plug including a slot for holding the plates together as claimed by Applicant in Claims 37-40.

WARD discloses that is known in the art to embed a sensor in a solid body (Col. 2, Lines 50-66) using a cylindrical plug 11, including a slot formed in the end and side of the plug (Col. 2, Lines 15-54) for holding the detector, as claimed by Applicant in Claims 25, 27 and 29; and further, **WARD** discloses the plug is threaded as claimed by Applicant in Claims 24, 26 and 28.

WARD is evidence that ordinary workers in the field of temperature and heat flux measurement would recognize the benefit of providing means for imbedding the sensor in the body comprising a cylindrical threaded plug 11, and including a slot formed in the

Art Unit: 2859

end and side of the plug as taught by WARD for the heat flux sensor of **SALLEE** in order to benefit from avoiding undesirable protrusions beyond the test surface.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the heat flux sensor of **SALLEE** with a means for imbedding comprising a threaded cylindrical plug 11, including a slot formed in the end and side of the plug as taught by WARD in order to benefit from avoiding undesirable protrusions beyond the test surface as taught by WARD.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U. S. Pat. No. 4577976 A (Hayashi et al.), Multi-layered thin film heat transfer gauge, discloses a thin film heat flux gauge which uses thin film resistors, not a thermopile.

U. S. Pat. No. 4541728 A (Hauser et al.), Device and method for measuring heat flux and method for forming such a device, and U. S. Pat. No. 3599474 A (Brown et al.), **SELF-CALIBRATING HEAT FLUX TRANSDUCER** disclose heat flux transducers having thermocouples or thermopiles.

U. S. Pat. No. 5021098 A (Burnett), High contact blind hole thermocouple plug; and U. S. Pat. No. 4245500 A (Malang, Sensor for determining heat flux through a solid medium, disclose embedded sensors, using a blind hole or threaded hole.

U. S. Pat. No. 2493651 A (BOELTER et al.), Thermoelectric heat flow responsive device, and U. S. Pat. No. 1528383 A (SCHMIDT), Device for the measurement of heat, disclose heat flux measuring devices including caps.

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stanley J. Pruchnic, Jr., whose telephone number is (571) 272-2248. The examiner can normally be reached on weekdays (Monday through Friday) from 7:30 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego F. F. Gutierrez can be reached at (571) 272-2245.

The ***Official FAX*** number for Technology Center 2800 is (703) 872-9306 for ***all official communications***.

Any inquiry of a general nature or relating to the status of this application or proceeding may be directed to the official USPTO website at <http://www.uspto.gov/> or you may call the **USPTO Call Center** at **800-786-9199** or 703-308-4357. The Technology Center 2800 Customer Service FAX phone number is (703) 872-9317.



Stanley J. Pruchnic, Jr.
2/23/04



DIEGO F. F. GUTIERREZ
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800